University of California
Lawrence Livermore National Laboratory

Nonproliferation, Arms Control, and International Security Directorate

March 1997

UCRL-MI-121428-NAI-10

# We are developing a broad-based program for countering the proliferation of biological weapons

## The BW Threat

The threat to national security posed by biological weapons is real and growing. Numerous pathogens could conceivably be used by nation-states, terrorist groups, or even individuals to contaminate hundreds of square kilometers and cause immense and indiscriminate harm to people, animals, and agricultural resources.

## Livermore's Counter-BW Program

As a national security laboratory, LLNL has a responsibility to apply its capabilities to address the biological weapon (BW) threat. Building on our large investment in biological science, instrumentation, and forensics, we are developing technologies, analysis techniques, and expertise to help stem the proliferation of biological weapons. An effective counter-BW program must incorporate a wide range of skills and technologies to address the threat on all fronts.

To this end, we are a key participant in the Department of Energy's Chem/Bio Nonproliferation Program, an integrated effort among the Livermore, Los Alamos, Sandia, and other national laboratories to develop technologies, analyses, and other means to prevent, reverse, and respond to the threat posed by these weapons. We also work with the various government agencies responsible for policy and treaties, intelligence analysis, monitoring and detection, and response to battlefield or terrorist use of biological weapons.

Livermore strengths in remote sensing, forensic science, intelligence analysis, atmospheric science, process modeling, systems analysis, hazardous materials handling, and bioscience are applicable to counter-BW needs. For example:

• Laboratory expertise in structural biology can be applied to determine the structure and function of biological toxins, information necessary for developing vaccines and medical countermeasures.

• Techniques developed for our genomics work are directly applicable to sequencing the genomes of biological warfare organisms to allow sensitive and accurate detection and to understand the mechanisms of infectivity.

• High-speed flow sorters and DNA amplification instruments (e.g., PCR devices) are being adapted for field detection and identification.

• Remote sensing techniques developed for monitoring nuclear test bans or environmental research can be modified for standoff detection and signature identification of biological weapon agents.

• The atmospheric transport and dispersion modeling capabilities of our National Atmospheric Release Advisory Center for nuclear and chemical hazards are being extended to biological materials to enable decision makers to minimize the exposure of populations at risk.

• Operational planning (including training exercises and drills) and real-time incident response capabilities, developed for nuclear and chemical incidents, are being adapted for response to incidents involving biological weapons.

## Recent Accomplishments

• Collaboration with the Los Alamos and Sandia national laboratories to develop and implement the Department of Energy's Chem/Bio Nonproliferation Program.

• Successful demonstration at a Joint Field Trial, held at Dugway, Utah, in October 1996, of a mini-flow cytometer. This instrument achieved a positive identification for 87% of the samples (four simulant materials representing typical biological weapon agents) with an exceptionally low false-positive rate of only 0.4%.

• First-ever demonstration of a mini-PCR instrument at the Dugway test. Unlike typical laboratory PCR instruments, which are bulky and require large power sources, our mini-PCR fits inside a suitcase, runs on batteries, and can be carried into the field and used for *in-situ* analyses.

• Hosting, together with the Monterey Institute of International Studies, of a Workshop on the Utility of Sampling and Analysis for Compliance Monitoring of the Biological Weapons Convention, in October 1996 at the Carnegie Endowment for International Peace in Washington, D.C.

## Benefits to the Nation

Livermore is building on its established programs in nuclear nonproliferation and emergency response to address the threat posed by biological weapons. Our efforts incorporate advanced technology, intelligence analysis, and policy support as applied to detection and identification of biological weapon activities, monitoring in support of the Biological Weapons Convention, forensics and attribution in the event of a BW incident, and equipment and technologies for battlefield defense or emergency response.

In addition to enhancing national and international security, our counter-BW work has valuable applications in agriculture, environmental science, food processing, pharmaceutical development, clinical microbiology, diagnosis and treatment of disease, and basic research on infectious diseases. Much of this research is conducted in collaboration with universities and other government laboratories.

## Contact

Don Prosnitz, Chief Scientist, Nonproliferation, Arms Control, and International Security Directorate; Phone: (510) 422-7504; Fax: (510) 423-6305; E-mail: dp@llnl.gov

Work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract W-7405-ENG-48.